

I would like to provide some comments on FCC ET Docket No. 04-37. I am an amateur radio operator, short-wave listener, and retired radio communications design engineer. I support providing increased access to wide band internet services. However, Access BPL has some serious shortcomings with no advantages and there are other methods available that do not interfere with licensed services. The only advantage that BPL seemed to have was lower cost coverage of rural areas. But when the BPL proponents realized how many repeaters it would take to cover these rural areas, they quickly dropped that aspect. (Will some one please tell Commissioner Powell?)

Although the proponents of BPL claimed it would not cause interference to licensed users of the HF spectrum, they apparently never tuned a short-wave receiver to any of their operating frequencies. Early trials claimed "no interference" because they were unannounced to the general public, and were operating over limited frequency bands. Also, they were operating over small geographic areas where there were no licensed stations operating in the limited bands where BPL was being tested. Since the tests were unannounced, users of the HF spectrum did not know about it and if they were interfered with, would not have known the source of the interference.

Since amateur radio operators have been aware of the operations in the Raleigh, NC area and Penn Yan, NY area, their tests have shown very strong interference levels. The just released report by the NTIA (04-413) confirms that BPL systems will produce strong interference levels. It is obvious (to anyone who has listened to an HF radio in a BPL area) that anyone being served by power lines carrying BPL of this type will find parts of the HF bands unusable. The HF spectrum is a valuable resource that we cannot allow to be destroyed, especially when there are both non-radiating methods (CATV and fiber) and broadcast methods (that use their own frequency bands) to supply broadband to the home. For BPL to co-exist with licensed services its radiated levels must be very low; they must be kept low, and there must be an easy way for licensed users of the HF spectrum to get an offending system to shut down immediately.

Amateur radio operators often communicate with stations that are far away and/or using low power and are, therefore, very weak and just above the noise floor. The noise floor (minimal discernable signal) of a typical amateur receiver in the 3-54 MHz range is about -130dBm. BPL radiations in the Amateur Radio bands will cause interference to Amateur communications at any level above this -130dBm noise floor. Since the BPL interference would be continual, it would be considered "Harmful interference" [§15.3 (m)] and would be prohibited. The FCC regulations, therefore, should limit BPL radiations in the Amateur Radio Bands (and other licensed services) to less than -130dBm at the receiver antenna connection.

Although amateurs try to keep their antennas located away from the power lines, that is not always possible. A typical fixed Amateur antenna installation could easily be within 10 meters of medium voltage power lines, and even closer to service lines and power lines in neighboring buildings.

In that a Part 15 system operates on a non-interference basis with licensed services, the Part 15 service should be required to make all possible efforts to prevent interference

with known licensed users of the spectrum they are using. This should start out by prohibiting operation of part 15 devices on specific frequencies, or bands of frequencies, assigned to licensed users in the area. The FCC has previously felt it necessary to prohibit part 15 devices completely from specific frequencies to protect licensed services. Besides prohibiting any operation by part 15, 18 & 76 devices on emergency frequencies, §15.221(d) protects AM (535-1705 kHz) broadcast stations and §15.242(d) protects television broadcast stations. In these cases, the FCC apparently felt that the usual “discontinue operation if you cause interference” rule was not enough and a more specific prohibition was required. Given BPL’s strong interference potential (affecting low to moderate level desired signals at fixed installations up to 460 meters from the power lines; per NTIA report 04-413), its 100% duty cycle, its wide frequency spectrum and its planned large physical area coverage; it seems that BPL is a very good candidate for specific frequency/band prohibitions. Therefore, I propose that BPL systems be limited to radiated emissions less than the equivalent of the noise floor (or minimum discernable signal level) level in all amateur and short-wave broadcast bands. These limits would also apply to all aviation, marine, land mobile, military and government frequencies and any other FCC-assigned frequencies that are authorized for use in the BPL’s operation area.

Regulations mandating BPL interference mitigation are certainly required. The “remote shut-down feature” is definitely required and remote power reduction and operating frequency control might be helpful. If power on a section of a specific BPL leg is reduced, there will be less signal on the line to reach the next repeater. If reduced sufficiently, the rest of the leg will shut down. I assume that there will be some extra power built into the system, but given the strength of the radiations measured by the NTIA, significant reductions in power will be required to significantly reduce interference levels. Lower power could be used initially, but that would mean more repeaters, which increases the initial investment.

Using a remote “adjustment of operating frequency” of the BPL system, to alleviate interference to a licensed user, only moves the problem to another frequency and another user. This will not be a viable method of interference mitigation, especially as the BPL system matures. A BPL system needs to use many bands of frequencies so that they do not interfere with themselves. In a mature system, changing the band used in one location (to alleviate a specific interference problem) will mean reconfiguring frequency bands in many locations so that the BPL system does not interfere with itself. This will become a more complex problem as a system grows, and it shifts the interference to other licensed users at a different frequency and/or location. Since there are a large number of users of the HF spectrum, most with multiple frequencies or bands of operation, there will be few places that BPL can operate without causing interference to licensed systems.

It would be better if a new broadband distribution service caused no interference to licensed services in the first place.

Until BPL becomes well established in an area, it will be difficult for licensed users of the spectrum to identify BPL interference. Therefore, I propose that a BPL system be

required to inform *all licensed users* of the spectrum who are located within two kilometers of power lines where the BPL system plan to operate. A public notice should also be given so that listeners of short-wave broadcasts will be informed. The notices should include:

1. the BPL's frequencies of operation,
2. specific locations of operation,
3. the statement that BPL system is not allowed to interfere with licensed communications and that they will immediately shut down if they cause interference,
4. a 24-7, toll-free, phone number of the BPL service, so interference complaints can be received at any time,
5. a guarantee of how long interference mitigation will take.

The public must be notified by the BPL operator that a BPL system may cause interference to their radio listening, and that users of the BPL data stream must accept the data stream being interrupted due to BPL's requirement not to interfere. Users of the BPL data stream must also be informed that they must accept interruption of data due to interference *from* licensed systems.

BPL should not be authorized as a Part 15 service. Most Part 15 devices/services operate on one discreet channel from one discreet location, and for short duty cycles. Any interference to a licensed service from such a device will be for a short time at a specific frequency and location. BPL will have a bandwidth of many MHz spread over a wide area and at a 100% duty cycle. The only presently authorized Part 15 system that uses wideband modulation are spread-spectrum systems that operate only in ISM bands.

§15.3 (m) defines "harmful interference" as any emission that "repeatedly interrupts a radio communications service." Since BPL has a 100% duty cycle, any interference will be continual, and therefore, "harmful interference."

A wideband distribution system presently regulated by the FCC that has a theoretical capability of interfering over a large part of the spectrum and over a large area is the Cable Television Service. This service distributes its signal through shielded cable, yet has its own FCC part (76) regulating leakage and mandating continual inspections of the cable system. Due to the inherent shielding and the *FCC regulations*, this service has existed fairly well with licensed services.

The power grid is designed to carry 60Hz energy. There is no way it can be expected to act like a transmission line in the 2-80 MHz range. Therefore it will tend to radiate a signal. If a shielded system, like CATV, requires its own FCC part, then shouldn't a radiating system, like BPL, also require its own FCC part? FCC Part 76 contains much about ownership of systems, program content, and compatibility of systems. If this is necessary for BPL systems, I leave it up to the lawyers. However, the technical standards should be determined by the engineers. FCC Part 76, Subpart K, "Technical Standards" has many requirements of the CATV system having to do with leakage measurements and the protection of licensed services that operate on the same frequency range as the CATV system. A BPL system should have requirements similar to those of Part 76, Subpart K; such as performance test, restricted frequencies, regular monitoring, logging of interference complaints, and responsibility of interference.

Comments to specific rule changes:

Proposed §15.3(ff): The proposed §15.3 (ff) definition of “Access BPL” is little different than the present §15.3 (f) and §15.3 (t) definitions of carrier current systems. Is the FCC proposing to classify Access BPL as an *intentional* radiator or an *unintentional* radiator? §15.3 (f) defines carrier current systems as being either intentional or unintentional radiators. The proposed new §15.3 (ff) does not specify, but it should.

New §15.3 (ff) should define purpose of Access BPL as something like “using wideband modulation to send high speed data into homes”. The minimum and maximum bandwidth of the wideband modulation should be defined; for example: “99% emission bandwidth greater than 1 MHz and less than 10 MHz.”

Proposed §15.109 (f): How are the proposed “adaptive interference mitigation techniques” supposed to work? How will they be initiated, and by whom? How soon must interference mitigation take place once interference to a licensed service is detected? Who decides if the “mitigation” is sufficient to prevent interference? What are the penalties to the BPL provider for non-compliance? The BPL operator must not only be able, but also willing, to shut down any area causing interference immediately.

Proposed §15.109 (g): Requiring BPL entities to register characteristics of their system is a good idea. However, one important fact was left out: a 24-7, toll free, contact phone number to report BPL interference to licensed services. It would seem logical that all BPL entities register with the FCC and that the FCC hold the database, since it would/should be the arbiter of any interference cases not quickly resolved. All cases of interference and their solutions should be logged by the BPL entity (cf. FCC §76.1706)

Summary:

- BPL has a large interference potential to licensed services in the HF spectrum.
- BPL should be prohibited (radiation kept below the receiver’s noise floor) from operation on all frequencies used by licensed services
- BPL entity should notify all licensed users of the spectrum they are sharing.
- BPL entity should notify public that their system is subject to shutdown due to no interference clause, and must also accept interference.
- More regulations & fines needed to ensure prompt interference mitigation.
- The term “Access BPL” needs to be better defined.
- BPL should have its own FCC part with regulations similar to CATV (Part 76).